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IS 15526 (2004): Packaging - Complete, Filled Transport Packages - Stability Testing of Unit Loads [TED 24: Transport Packages]

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Indian Standard

PACKAGING — COMPLETE, FILLED TRANSPORT PACKAGES — STABILITY TESTING OF UNIT LOADS

ICS 55.180.40

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NEW DELHI 110002

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Price Group 3

Transport Packages and Packaging Codes Sectional Committee, TED 24

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Transport Packages and Packaging Codes Sectional Committee had been approved by Transport Engineering Division Council.

The packages intended for transport of goods are required to fulfil the primary function of physical protection to the contents. The packages are transported normally by road, rail, sea and air, as also inland waterways either by one or a combination of these modes. The nature of hazards that are confronted during transport is widely varying depending upon the distribution system, handling methods, skills of staff employed. Stability of unit loads tests are developed for complete, filled transport packages with a view to assess the performance of completely formed unit loads as they are subjected to the hazards of environmental exposure, storage, handling and transportation.

The unit loads covered in this standard are not restricted to those incorporating a pallet platform but also other devices such as pallet boxes or slip sheets.

In the preparation of this standard considerable assistance has been derived from ISO 10531 : 1992 'Packaging — Complete, filled transport packages — Stability testing of unit loads' issued by International Organization for Standardization.

The composition of the committee responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PACKAGING — COMPLETE, FILLED TRANSPORT PACKAGES — STABILITY TESTING OF UNIT LOADS

1 SCOPE

This standard specifies methods of testing for the stability of unit loads which are subjected to the hazards of environmental exposure, storage, handling and transportation related to land environment only.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
7028	Performance tests for complete, filled transport packages:
(Part 1) : 2002	Stacking tests using static load (*second revision*)
(Part 2) : 2002	Vibration test at fixed low frequency (*second revision*)
(Part 3) : 2002	Horizontal impact tests (horizontal or inclined test, pendulum test) (*second revision*)
(Part 9) : 1987	Stacking test using compression tester (*first revision*)
(Part 12) : 2002	Vibration test using a sinusoidal variable frequency (*first revision*)
7031 : 2002	Method of conditioning for testing of complete, filled transport packages (*second revision*)
9733	Guidelines for the compilation of performance test schedules of complete, filled transport packages:
(Part 1) : 1981	General principles
(Part 2) : 1989	Quantitative data
14208 : 1995	Packaging — Unit load sizes — Dimensions

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Unit Load — Load consisting of items or packages held together by one or more means and shaped or fitted for handling, transporting, stacking and storing as a unit. The term is also used to describe a single item adapted for the same purpose.

3.2 Clamp Handling — Handling method using a special fork-lift clamping attachment for applying sufficient compression to opposite sides of unit loads such that complete loads can be stored, handled and transported.

3.3 Push/Pull Handling — Handling method using a special fork-lift gripper attachment or other suitable means for pushing/pulling loaded slip sheets on to a load plate such that complete loads can be stored, handled and transported.

4 APPARATUS

4.1 Equipment for compression and vibration tests shall be as specified in the appropriate standard listed in Table 1. Equipment for the horizontal impact test shall be as specified in IS 7028 (Part 3) except for the inclined plane test (**7.2.2.1**).

4.2 In making the drop test, the unit load may be handled with any convenient equipment, such as a block and tackle, a hoist, or jacks with release mechanism such that the fall of the unit load is not obstructed by any part of the apparatus before striking the impact surface.

4.3 In making the clamp lift test, use an actual lift truck equipped with the appropriate load clamping device to lift the unit load. Provision shall be made to measure the clamp force between the platens, using a load cell or other suitable device.

4.4 In making the push/pull pack test, use an actual lift truck equipped with an appropriate push/pull attachment for pulling the load onto the load plate by the slip sheet tab. Alternatively, any suitable pulling device equipped with a gripper jaw may be used.

5 PACKAGE PREPARATION

5.1 The test package shall normally be filled with its intended contents. However, simulated or dummy contents may be used on condition that the dimensions and physical properties of such contents shall be as close as possible to those of the intended contents.

5.1.1 Ensure that the test package is closed normally, as if ready for distribution. If simulated or dummy contents are used, ensure that the normal method of closure is still employed.

6 CONDITIONING

6.1 As it is practically impossible to condition a complete unit load to such an extent that all goods and packaging materials are brought and kept in equilibrium with the climate applied without detaching the packaging materials, conditioning of the unit load is omitted. However, when composing the unit load for testing, the goods and packaging material may be subject to the same conditions as for normal transportation.

6.2 The package shall be conditioned in accordance with one of the conditionings described in IS 7031.

6.3 After testing, moisture determinations may be carried out on the packaging materials.

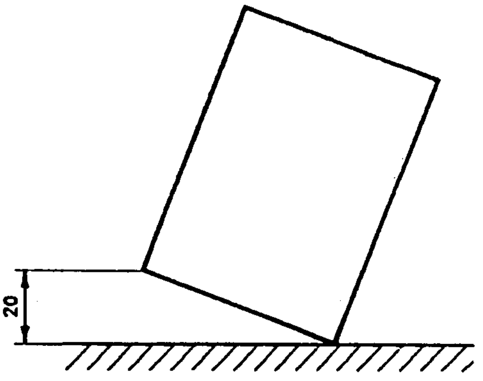
7 PROCEDURE

7.1 General — Tests shall be conducted under ambient conditions of temperature and humidity as specified in Table 1 and in the sequence shown. Test intensities shall be chosen according to the general principles specified in IS 9733 (Part 1) and their values shall be as specified in IS 9733 (Part 2).

7.2 Pallet Handling Tests

7.2.1 *Drop Test* — It determines the ability of the palletized load to withstand accidental drops, using the following two methods.

7.2.1.1 *Drop flat on base by tilting on one edge* — With one edge of the unit load supported by a hard, solid surface (for example concrete), raise the other end 20 cm and release to fall freely (*see* Fig. 1).



All dimensions in millimetres.

FIG. 1 DROP FLAT ON BASE TEST

7.2.1.2 *Bottom edge impact* — With the unit load on a hard, solid surface (for example concrete), raise one end of the surface load and set upon a timber or other support 5 cm high so that the edge of the load is at the most 10 cm from the corner of the support [*see* Fig. 2(a)]. Raise the other end of the load till the base of the load is 20 cm above floor level [*see* Fig. 2(b)]

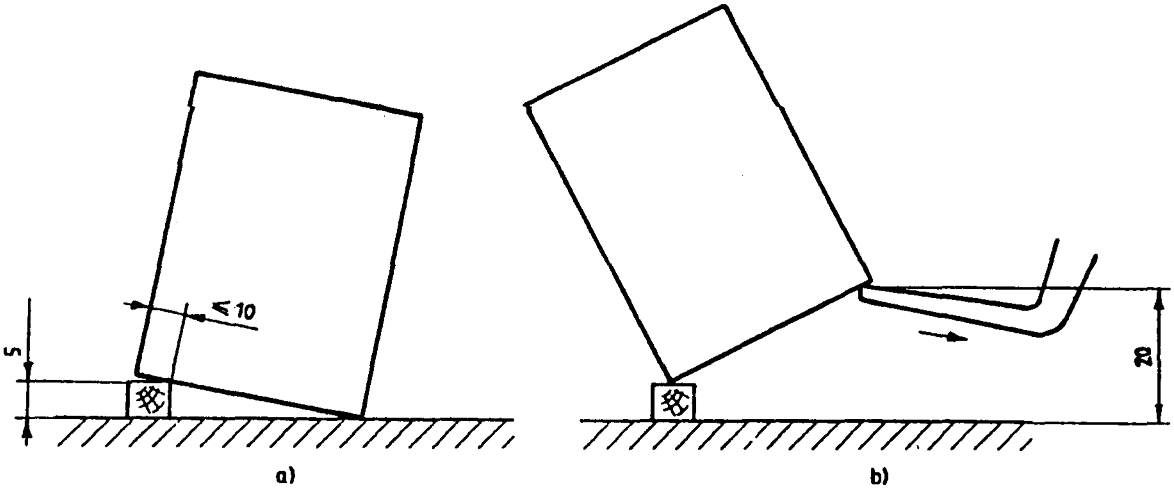
Table 1 Unit Load Tests

(*Clauses* 4.1 *and* 7.1)

Test No.	Environmental Factor	Tests (Unit Load Handling Method)			
		Pallet		Clamp	Push/Pull pack
		Restrained load	Unrestrained load		
(1)	(2)	(3)	(4)	(5)	(6)
i)	Storage	Static compression, as specified in IS 7028 (Part 1) or IS 7028 (Part 9)	Static compression, as specified in IS 7028 (Part 1) or IS 7028 (Part 9)	Static compression, as specified in IS 7028 (Part 1) or IS 7028 (Part 9)	Static compression, as specified in IS 7028 (Part 1) or IS 7028 (Part 9)
ii)	Handling	Drop flat on base by tilting on edge course (*see* **7.2.1.1**) and either drop on base edge[1] (*see* **7.2.1.2**) or run test course horizontal impact test against Block (*see* **7.2.2**)	Run test course	Run test course	Run test course
iii)	Transportation	Vibration[2] as specified in IS 7028 (Part 12) or IS 7028 (Part 2)	Vibration[2] as specified in IS 7028 (Part 12) or IS 7028 (Part 2)	Vibration[2] as specified in IS 7028 (Part 12) or IS 7028 (Part 2)	Vibration[2] as specified in IS 7028 (Part 12) or IS 7028 (Part 2)

[1] Edge drops stress unit load stability to a greater degree, while flat drops more closely simulate most actual conditions.

[2] Where test facilities permit, use full height loads as actually encountered in transportation.



All dimensions in millimetres.

FIG. 2 BOTTOM EDGE IMPACT TEST

and release the load to fall freely. Where loads are tall or top-heavy, provision must be made to prevent the load from tipping over, after the drop is made.

7.2.2 *Horizontal Impact Test* — The ability of the palletized load to withstand repeated horizontal impacts against its base edges shall be evaluated using one of the tests specified in **7.2.2.1** to **7.2.2.3**.

7.2.2.1 *Inclined plane test* — Use a modified inclined plane (10°) tester as shown in Fig. 3 to support the load and provide the horizontal impacts. Place the palletized load on the sled and against the stop block. Draw the sled up the incline for 4 m and allow it to roll freely down the slope, striking against the rigid backstop.

7.2.2.2 *Pendulum impact test* — Use the method described in IS 7028 (Part 3) with the optional hazard at the base of the pallet.

7.2.2.3 *Horizontal plane test* — Use the method described in IS 7028 (Part 3) with the optional hazard at the base of the pallet.

7.3 Clamp Handling Test

7.3.1 *General*

7.3.1.1 This test is carried out to evaluate the ability of the unit load to withstand repeated side compressions.

7.3.1.2 A lift truck as specified in **4.3** shall be used. If the unit loads are normally handled too high, a second equivalent load should be placed on the unit to be tested prior to clamping.

7.3.1.3 Provision shall be made for measuring the total force applied to the load using the equipment described in **4.3** placed at critical locations. The clamp force between the platens and the hydraulic pressure at all available clamp settings shall be measured.

7.3.2 *Procedure*

7.3.2.1 Clamp the unit load in a manner typical of current or expected practice, starting with the lowest clamp force and increasing the clamp setting until the load can be successfully transported without damaging the contents (product). For the handlings to follow, clamp the unit load at the next higher clamp setting on the truck.

7.3.2.2 Clamp, lift and transport the unit load over a test course as described in **A-1** under conditions identical to those specified in **A-2** of the Annex A.

7.3.2.3 If the unit load is normally clamped from both directions, distribute the test cycles based on the probability of clamping from each direction.

7.3.2.4 The test can be repeated for a predetermined number of handlings or until failure occurs.

7.4 Push/Pull Handling Test

7.4.1 *General*

7.4.1.1 This test is carried out to evaluate the ability of the unit load to withstand repeated handlings using a lift truck equipped with a push/pull pack device.

7.4.1.2 A lift truck as specified in **4.4** shall be used. If the unit loads are normally handled too high, a second equivalent load should be placed on the unit to be tested prior to testing.

7.4.2 *Procedure*

7.4.2.1 Pick up, lift and transport the unit load over the test course as described in **A-1** under conditions identical to those specified in **A-2** of Annex A.

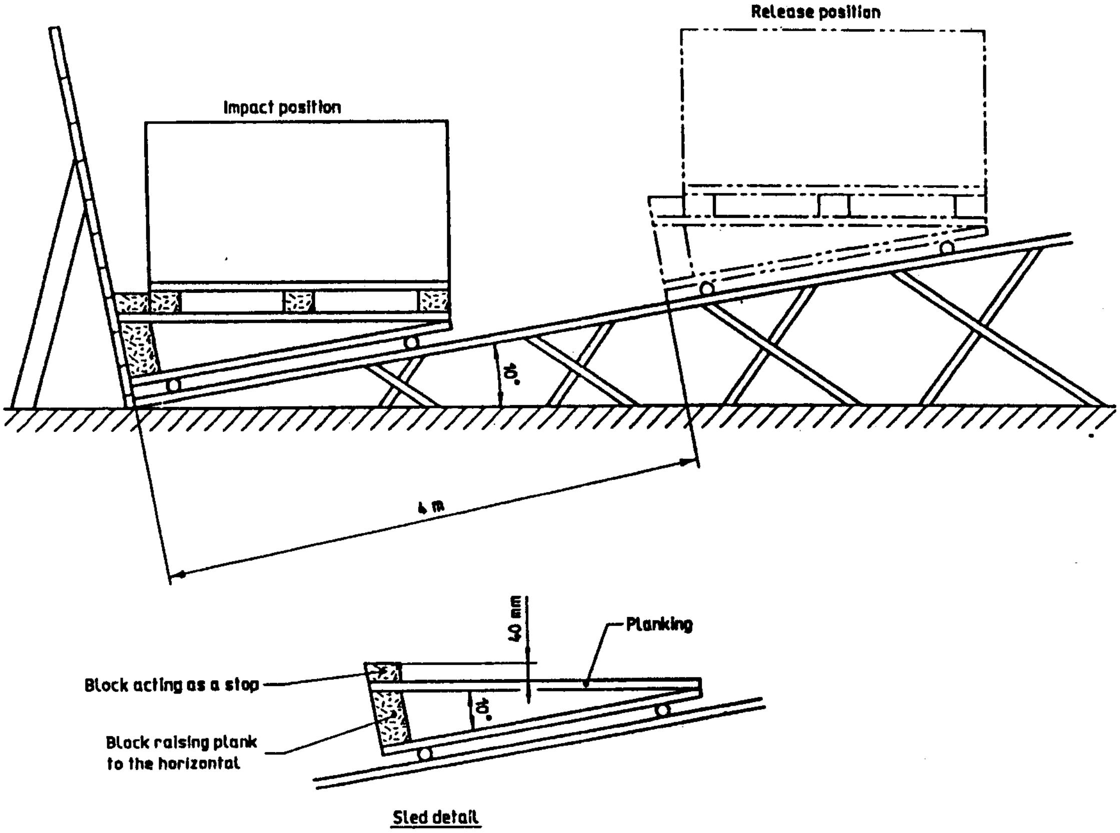


FIG. 3 MODIFIED INCLINE IMPACT TEST FOR HORIZONTAL IMPACTS ON BASE EDGES OF UNIT LOADS

7.4.2.2 If the unit load is normally picked up from both directions, distribute the test cycles accordingly based on the probability of picking up from each direction.

7.4.2.3 The test can be repeated for a predetermined number of handlings or until failure occurs.

7.5 Examination of Failure — After each test in **7.2** or each handling cycle (pickup/transport/setdown) in **7.3** and **7.4**, examine the unit load to determine if failure has occurred. Failure is defined as any of the following:

a) Package damage resulting in the inability of the product to sustain further distribution, storage or handling.

b) Integrity of the unit load has been degraded to such an extent as to risk instability on further handling.

8 TEST REPORT

The test report shall include the following particulars:

a) Reference to this standard;

b) Number of replicate unit loads tested;

c) Full description, including unitizing techniques, dimensions in accordance with IS 14208, structural and material specifications of the unit load;

d) Description of contents, whether simulated or dummy contents were used and if so a full description of the load design;

e) Gross mass of unit load and net mass of contents, in kilograms;

f) Temperature and relative humidity of test area at time of test;

g) Which test method(s) was (were) used;

h) Any deviations from the test method(s);

j) A record of the results, with any observations which may assist in correct interpretation;

k) Date of the test; and

m) Signature of tester.

ANNEX A

(*Clauses* 7.3.2.2 *and* 7.4.2.1)

LIFT TRUCK HANDLING TESTS

A-1 TEST COURSE

A-1.1 A standard "L" shaped test course should be established on a flat rigid surface and include 3 to 3.5 m wide aisles with a 90° turn, appropriate acceleration/deceleration zones and observation points (OP1 to OP5) (*see* Fig. 4).

A-1.2 User-defined obstacles may be placed on the test course. Obstacles, such as railway tracks set flush with the road surface, ramps, gratings, etc, should be crossed perpendicularly and also, other than the ramps, at an angle.

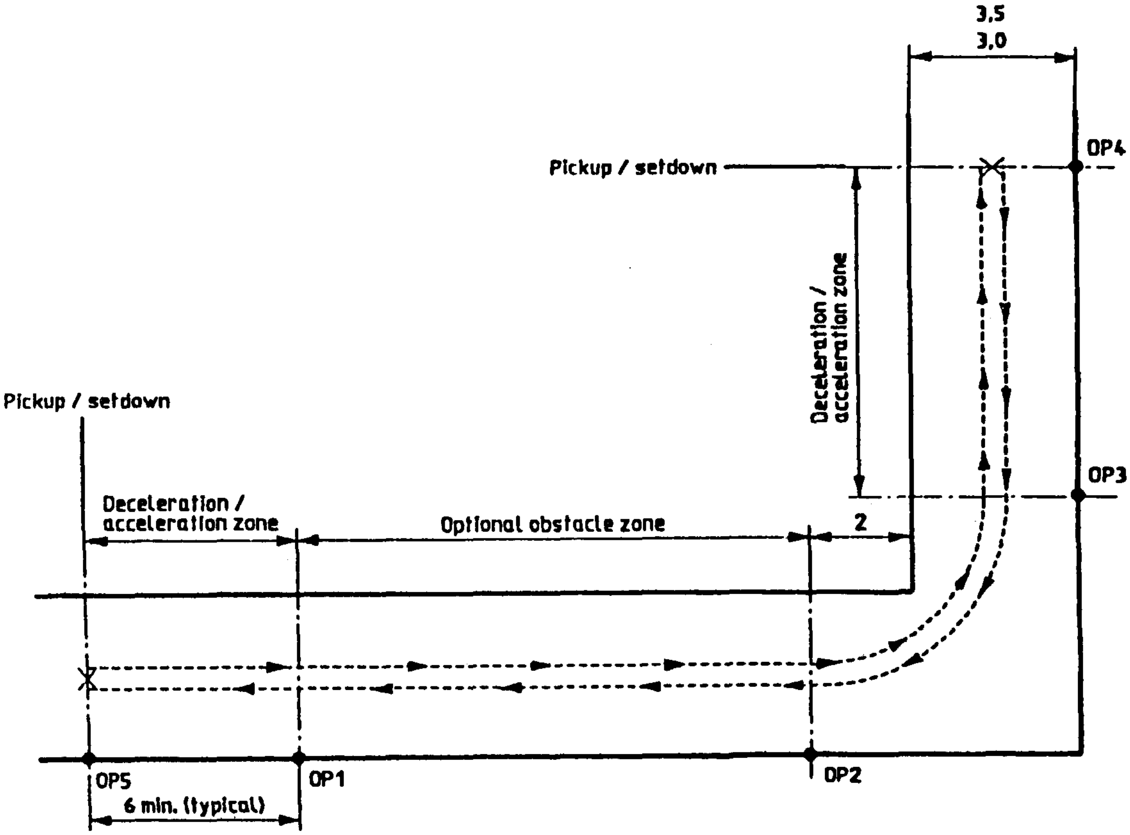
A-2 TEST CONDITIONS

A-2.1 Lift truck velocity through the test area, with or without obstacles, should be at uniform "walking" rate of 1.5 ±.3 m/s.

A-2.2 The maximum velocity of the lift truck in the turn should be 1 m/s.

A-2.3 A minimum deceleration of 2 m/s^2 should be reached to the deceleration zones as part of the emergency stop test.

A-2.4 The unit load under test should be examined after each cycle of handling (pickup/transport/setdown).



All dimensions in millimetres.

FIG. 4 SAMPLE TEST COURSE

ANNEX B

(Foreword)

COMMITTEE COMPOSITION

Transport Packages and Packaging Codes Sectional Committee, TED 24

Organization	*Representative(s)*
Indian Institute of Packaging, Mumbai	Shri Rajiv Dhar (***Chairman***) Shri Manik Koli (*Alternate*)
Balmer Lawrie Van Leer Ltd, New Mumbai	Shri Ajit Shah
Bayer India Ltd, Thane	Dr N. K. Ponkshe Shri Atul J. Sawant (*Alternate*)
Container Corporation of India Ltd, New Delhi	Shri Harpreet Singh Shri A. K. Khosla (*Alternate*)
Department of Explosives, Nagpur	Nomination Awaited
Department of Telecommunications, New Delhi	Nomination Awaited
Dimple Drums & Barrels Ltd, Mumbai	Shri Rajesh H. Katharia
Directorate of Plant Protection, Quarantine & Storage, Faridabad	Dr P. S. Chandurkar Dr Ram Sanehi Sharma (*Alternate*)
EAN India, New Delhi	Shri Ravi Mathur Shri Dushyant (*Alternate*)
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Larsen & Toubro Limited, Mumbai	Shri H. H. Doshi
Research, Designs & Standards Organization, Lucknow	Nomination Awaited
Shipping Corporation of India Ltd, Mumbai	Nomination Awaited
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